



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

Address: COMMISSIONER FOR PATENTS

P.O. Box 1450

Alexandria, Virginia 22313-1450

www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/624,076	07/21/2003	Vladimir Mancevski	500929.000017B	5156
<div>7590 Xidex Corporation Suite 703 8906 Wall Street Austin, TX 78754</div>				
12/07/2010				
EXAMINER				
MCCRACKEN, DANIEL				
ART UNIT		PAPER NUMBER		
1736				
MAIL DATE		DELIVERY MODE		
12/07/2010		PAPER		

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/624,076

Applicant(s)

MANCEVSKI, VLADIMIR

Examiner

DANIEL C. MCCracken

Art Unit

1793

Period for Reply -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 September 2010.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 25-45 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 25-45 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 7/21/2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/GS/US)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Citation to the Specification will be in the following format: (S. # : ¶/L) where # denotes the page number and ¶/L denotes the paragraph number or line number. Citation to patent literature will be in the form (Inventor # : LL) where # is the column number and LL is the line number. Citation to the pre-grant publication literature will be in the following format (Inventor # : ¶) where # denotes the page number and ¶ denotes the paragraph number.

Status of Application

The response dated 8/17/2009 (corrected 9/13/2010) has been received and will be entered. Claims 25-45 are pending. Claims 25-27, 33, 35-37, and 42-43 are currently amended. Claims 1-24 and 46 are acknowledged as cancelled.

Response to Arguments

Claim Rejections – 35 U.S.C. §102

I. With respect to the rejection of Claims 25-29, 32-40 and 42-45 under 35 U.S.C. 102(b) as being anticipated by WO 96/38705 to Baldeschwieler, et al. (California Institute of Technology) in view of Iijima, et al., *Single-shell carbon nanotubes of 1-nm diameter of 1-nm diameter*, Nature 1993: 363: 603-605 (hereinafter “Iijima at ___”), Applicants rely on claim amendments. *See* (Remarks of 8/17/2009 at 7) (“As amended, Claim 25 includes the limitation that ‘at least one protrusion extending from the substrate, at least one nano-sized pore located near the end of the protrusion distal from the substrate, wherein the pore has a depth longer than [*sic* - than] its diameter’ . . . Baldeschwieler et al. do not disclose nor teach pores that have depth

longer than [*sic* – than] its diameter. Li, et al. do not disclose nor teach a protrusion extending from the substrate, and they do not disclose nor teach a nano-sized pore located near the end of a protrusion distal from the substrate.” Reference to the Li reference here was inapposite, as it did not form the basis of the rejection. As to the newly claimed language, this has been considered and is persuasive. The rejection is WITHDRAWN.

Claim Rejections – 35 U.S.C. §103

I. With respect to the rejection of Claims 25-29, 32-45 under 35 U.S.C. 103(a) as being unpatentable over WO 96/38705 to Baldeschwieler, et al. (California Institute of Technology) in view of Iijima, et al., *Single-shell carbon nanotubes of 1-nm diameter of 1-nm diameter*, Nature 1993: 363: 603-605, the traversal relies on amendments. *See generally* (Remarks of 8/17/2009 at 7-8). This has been considered and is persuasive. The rejection is WITHDRAWN.

II. Claims 25-46 are rejected under 35 U.S.C. 103(a) as being unpatentable over WO 96/38705 to Baldeschwieler, et al. (California Institute of Technology) in view of Iijima, et al., *Single-shell carbon nanotubes of 1-nm diameter of 1-nm diameter*, Nature 1993: 363: 603-605 in view of Li, et al., *Large-Scale Synthesis of Aligned Carbon Nanotubes*, Science 1996; 274: 1701-1703 (hereinafter “Li at ___”), the traversal relies on amendments. *See generally* (Remarks of 8/17/2009 at 9) (incorporating prior arguments). This has been considered and is persuasive. The rejection is WITHDRAWN.

Claim amendments – Discussion

The remarks state that the amendments to Claim 25 are supported “in Figures 2 and 3 of the Specification, in Specification 11:14, and in general in pages 8-11 of the Specification.” (Remarks of 8/17/2009 at 8). The Examiner considers the most salient passages to be those found at (S. 9: 5-7) (“Commercial carbon nanotube tips need to have an aspect ratio of about 10:1, which implies a length of about 1 μm for a 100 nm diameter tip.”), (S. 9: 13-15) (“The following technologies are capable of satisfying the above geometrical requirements: electrochemical or photoelectrochemical etching, micromachining and lithography.”), and (S. 9: 26-27) (“EC/PEC etching is used to control the number, diameter, shape, location, depth, and orientation of the holes.”). In light of these passages, and especially that describing the aspect ratio, it is reasonably clear that Applicants had possession of the pore with the dimensions as claimed. However, in reviewing the disclosure for support, it is noted that the reference numerals in the drawing are not discussed in the Specification. An objection is made accordingly below.

Drawings

I. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: those reference numerals in Figures 2-3.

Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet

submitted after the filing date of an application must be labeled in the top margin as either “Replacement Sheet” or “New Sheet” pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

I. Claims 25-45 are rejected under 35 U.S.C. 103(a) as being unpatentable over WO 96/38705 to Baldeschwieler, et al. in view of

- (i) Li, et al., *Large-Scale Synthesis of Aligned Carbon Nanotubes*, Science 1996; 274: 1701-1703 (hereinafter “Li at __”) and**
- (ii) US 6,258,401 to Crowley.**

With respect to Claim 25, this claim requires “a substrate.” Baldeschwieler teaches a substrate. (Baldeschwieler “Fig. 1B,” 6: 9) (“cantilever 31”). Claim 25 further requires “at least one protrusion extending from the substrate.” Baldeschwieler teaches a protrusion. (Baldeschwieler “Fig. 1B,” 6: 10) (“tip 30”).

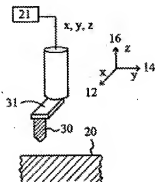


FIG. 1B

Claim 25 further requires “at least one nano-sized pore located near an end of the protrusion distal from the substrate; wherein the pore has depth longer than its diameter.” Baldeschwieler teaches a pore near the end of the protrusion/tip. (Baldeschwieler “Fig. 6,” 30: 1-10).



FIG. 6

Annotated Figure 6 is provided to show the pore. The “arrow” added shows what is being interpreted as a pore, *i.e.* the location where the “tip 42” meets the “macromolecule 45.” Alternatively, as discussed extensively *infra*, the Li and Crowley references disclose nanotubes from pores in silicon. Baldeschwieler teaches that the tip 42 can be silicon. (Baldeschwieler 6: 10). Claim 25 further requires “at least one carbon nanotube partially embedded in the pore.” Baldeschwieler teaches that the macromolecule 45 in “Fig. 6” can be a carbon nanotube. (Baldeschwieler 30: 6-7).

Baldeschwieler does not, however, appear to teach the dimensions of the newly claimed pore, *i.e.* the depth being longer than the length. Note however the teachings of Baldeschwieler. Baldeschwieler states “the macromolecule 45 needs to be sufficiently rigid after attachment to the tip 42 in order to avoid undesired displacement which is not under control of the computer-controlled mechanism for moving the tip.” (Baldeschwieler 30: 2-4). Baldeschwieler further teaches that “the completed tip comprises a single, rigid macromolecule 45 *rigidly attached* to a small area of the apex of a scanning probe tip 42.” (Baldeschwieler 31: 23-24) (emphasis added).

Thus, Baldeschwieler would appear to identify stiffness or rigidity between the tip and the macromolecule/nanotube as desirable. Furthermore, note that Baldeschwieler teaches that “[t]he macromolecule will be attached to the substrate probe tip material *in a manner which restricts motion with respect to the substrate.*” (Baldeschwieler 16: 16-17).

The Li document teaches pores with nanotubes partially embedded in them. Figure 4 of Li is reproduced below:



Fig. 4. Possible growth model of carbon nanotubes formed on iron nanoparticles embedded in mesoporous silica. Carbon nanotubes formed on iron nanoparticles embedded in the vertical cylindrical pores grow perpendicular to the surface of the substrate (marked A). Those formed on iron nanoparticles embedded in inclined cylindrical pores were tilted along the axis of the pores (marked B), whereas those formed on iron nanoparticles exposed on the surface of the substrate might grow freely (marked C). Tip or base growth is determined by the contact force between the iron nanoparticles and the silica network.

As to the depth length/diameter limitation, note that Li reports diameters of 10 nm. (Li at 1703, col. 1). From these reported dimensions, Li reasonably suggests the claimed dimensions from Fig. 4.. Employing a pore with a catalyst and growing the nanotube *in situ* as taught by Li would appear to be within the skill in the art. Having the nanotube embedded in the pore would restrict the motion of the nanotube relative to the tip, as suggested by Baldeschwieler. The argument could be made that the combination is not proper given that Baldeschwieler uses silicon tips/substrates – *see* (Baldeschwieler 6: 9-15) – and Li uses a silica substrate. (Li at 1702, col. 2). This has been considered, but not perceived to be a “teaching away” from either document, as a third document, US 6,258,401 to Crowley (while discussing the Li reference) teaches that silicon

substrates can be employed. *See* (Crowley 5: 54). Note also that Crowley teaches nanotubes in pores, etc. *See e.g.* (Crowley “Figs. 2-3”). Thus, restated, one would be motivated to employ a pore technique like that taught by Li/Crowley because it would appear to restrict the motion between the tip (*i.e.* nanotube) and the substrate, which was taught as desirable by the Baldeschwieler document.

As to Claim 26, pointy tips are taught. (Baldeschwieler “Fig. 1B, Fig. 6”). As to Claim 27, a flat tip is taught. (Baldeschwieler “Fig. 6”) (note area between tip 42 and CNT 45). As to Claim 28, silicon is taught. (Baldeschwieler 6: 9-15). As to Claim 29, a tip/substrate of the same material is taught. *Id.* As to Claim 30, either Li or Crowley teaches the pore and catalyst configuration. (Li at 1703, “Fig. 4”), (Crowley 5: 52 *et seq.*, “Fig. 2-3”). As to Claim 31, at least iron is taught. *Id.* As to Claim 32, the perpendicular configuration is taught. *Id.* As to Claim 33, other angles are taught. (Li at 1703, “Fig. 4”). As to Claim 34, *see* (Baldeschwieler “Fig. 6”) (note area between tip 42 and CNT 45). As to Claim 35, the planar surfaces, etc. are reasonably suggested by the embodiments in “Fig 1B” and “6” in Baldeschwieler. As to Claim 36, *see* (Li at 1703, “Fig. 4”), (Crowley 5: 52 *et seq.*, “Fig. 2-3”). As to Claim 37, the combination is reasonably suggested in light of the rationale expressed in connection with Claim 25 *supra*. As to Claim 38, the diameter is taught. *See e.g.* (Li at 1703, col. 1). As to Claim 39-40, SWNT (which would meet the limitations) are reasonably suggested by modification of growth conditions. (Li at 1703, col. 1) (“We believe that it is possible to produce arrays consisting of very thin and possibly even single-layered (4) carbon nanotubes, by improving the growth conditions.”). As to Claim 41, the aspect ratio is reasonably suggested by the figures of Li and Crowley. Alternatively, it is controlled by controlling the duration of the CVD reaction. As to Claim 42,

Baldeschwieler teaches a protrusion. (Baldeschwieler "Fig. 1B, Fig. 6"). Duplication of parts does not impart patentability. *See* MPEP 2144.04 VI. B. As to Claim 43, the combination is suggested by Li & Crowley, see discussion above. As to Claims 44-45, these claims are being interpreted as reciting intended uses. Note that Baldeschwieler is directed to microscopy. A surface/substrate like that taught by Baldeschwieler can be "adapted" to anything by virtue of there being a surface; it provides locations for attachment, etc.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DANIEL C. MCCracken whose telephone number is (571)272-6537. The examiner can normally be reached on Monday through Friday, 9 AM - 6 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley S. Silverman can be reached on (571) 272-1358. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 1793

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Daniel C. McCracken/
Daniel C. McCracken
Examiner, Art Unit 1736
DCM

/Stanley S. Silverman/
SPE, Art Unit 1736